The effects of industry cluster knowledge management on innovation performance ☆

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ABSTRACT

Research on industrial clusters mostly focuses on the effects of the competitive advantage they generate. This study takes a different approach, conducting empirical research on three types of Taiwanese parks (export processing zones, industrial zones, and science parks), in which economic development is particularly prominent, and which have industry cluster characteristics. The study explores the effects of special resources and relationships among cluster firms on innovation performance, and focuses on knowledge management as the mediator for investigation. A survey, regression analysis, and correlation analysis probe into the effects of the special resources and relationships among industrial clusters on corporate knowledge management and innovation performance. Knowledge management emerges as the mediator of industry clusters in terms of corporate innovation performance, thus providing support for the research hypotheses. The findings of this study are valuable for further research and strategic thinking on the sustainability of corporate operations.

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1. Introduction

Over the last few decades, scholars are dedicating an increasing amount of their research efforts to the relation between industrial cluster knowledge management and innovation (Arikan, 2009; Bell, 2005; Casanueva, Castro, & Galán, 2013; Connell & Voola, 2013; Gnyawali & Srivastava, 2013; Lissoni, 2001; Phelps, 2010; Tallman, Jenkins, Henry, & Pinch, 2004). The knowledge necessary for corporate innovation activities is, however, more complex, and even large-scale firms face shortages of knowledge. Given their scarce resources, firms attempt to cooperate with other firms to acquire knowledge and resources, and engage in cross-organizational learning to enhance innovation performance (Casanueva et al., 2013; Yli-Renko, Autio, & Sapienza, 2001). The industrial cluster is a new organizational form that aims to enhance regional development. By forming a cluster, firms can lower their investment costs and facilitate the acquisition of professional labor, knowledge, and techniques to access common suppliers, cultivate professional labor, create spillover effects of techniques and knowledge, and enhance competitiveness (Amin &

Thrift, 1995; Bell, Tracey, Jan, & Heide, 2009; Casanueva et al., 2013; Connell & Voola, 2013; Gertler, 2003; Tallman et al., 2004).

Most extant studies on industrial clusters discuss the relationships and effects between innovation systems or activities, and clusters (Bell, 2005; Gnyawali & Srivastava, 2013; Phelps, 2010; Porter & Stern, 2001; White & Bruton, 2007; Yeh & Chang, 2003; Yli-Renko et al., 2001), the effects of industry clusters on corporate competitive advantages (Amin & Thrift, 1995; Bahrami & Evans, 1995; Bell et al., 2009; Gertler, 2003; Zhang & Li, 2010), and the knowledge management of cluster firms (Arikan, 2009; Casanueva et al., 2013; Lissoni, 2001; Tallman et al., 2004). Although, in terms of innovation performance, knowledge is one of the most important factors in an industrial cluster (Arikan, 2009; Belso-Martinez, Molina-Morales, & Mas-Verdu, 2011; Casanueva et al., 2013; Tallman et al., 2004), the effect of industry clusters on innovation performance and the role of knowledge management as a mediator are seldom the focus of discussion (Connell & Voola, 2013). With the increasing importance of knowledge management and innovation, what is the current level of awareness of knowledge management in relation to cluster firms? With the special resources and relationships that characterize cluster firms, are the effects on corporate knowledge management significant and do they influence performance? This study aims to explore the theory regarding the effects of industry cluster knowledge management on innovation performance and validation in an attempt to contribute to both theory and practical management.

In terms of its industry cluster development index for the years 2007–2009, Taiwan ranks first worldwide, according to the

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competitiveness ratings of the WEF (World Economic Forum, 2007–2009). This leading position demonstrates the competitive advantage of Taiwan's industry cluster development. Following the economic reforms in China, Taiwan's economic development is particularly prominent. China is taking its cue from the Taiwanese model when establishing its own Export Processing Zones. More than 200 economic zones following the EPZ model are now appearing around the world. Thus, the three main kinds of parks used to compile the Taiwanese industrial cluster index are the focus of this study.

2. Research hypotheses

In accordance with its research purpose and motivation, this study develops four hypotheses to explore the effects of the relationships between the knowledge management of industrial clusters and innovation performance. A description of these hypotheses appears below.

With respect to the effect of industrial clusters, the conditions for successful clusters mean that firms should form networks with knowledge sharing and information exchange (Breschi & Malerba, 2001; Porter, 1998). Therefore, cluster zones with advanced knowledge and techniques are attractive to new companies because they can reinforce local industry's capabilities and knowledge base (Maskell, 2001b). In a knowledge economy, information and knowledge exchange within a cluster can enhance firms' capabilities and lead to knowledge creation (Arikan, 2009; Casanueva et al., 2013; Lissoni, 2001; Lorenzen & Maskell, 2004; Maskell, 2001a, 2001b). Drawing on these findings, this study suggests that interaction and exchange within an industrial cluster can center on knowledge. The use of cluster resources and relationships by firms to acquire knowledge management, and obtain or create new knowledge influences the performance of innovation activities.

H1. Industry clusters significantly and positively influence knowledge management.

Knowledge management facilitates effective information exchange and cost benefits. Afuah (1998) and Porter (1990) suggest that the key to innovation activities is to apply new knowledge to commercialization, and to create corporate value. Corporate innovation activities mean that members contribute implicit techniques and knowledge to create and confirm the concepts of new products. Finally, knowledge that individuals acquire in the innovation process spreads to different departments, and even different organizations. Thus, knowledge management is one of the main forms of lowering uncertainties when reforming technical systems (Carrillo & Gaimon, 2004; Nonaka & Takeuchi, 1995). Arikan (2009), Belso-Martinez et al. (2011), Casanueva et al. (2013), Koskinen (2000), Koskinen, Pihlantob, and Vanharanta (2003), Nonaka and Takeuchi (1995), and Oliver, Dostaler, and Dewberry (2004) all indicate that the enhancement of knowledge management yields improvements in innovation performance. Drawing on the above literature, innovation activities create an environment for the exchange of knowledge. As for product development, innovation enhances both member exchange and interaction, which in turn triggers demand for knowledge, and develops diverse knowledge activities for knowledge integration. Therefore, knowledge management and innovation activities share a relationship.

H2. Knowledge management significantly and positively influences innovation performance.

Industrial clusters enhance the depth and breadth of cooperation and competition, and bring together various industries to form cluster relationship networks, which boosts corporate operational performance (Anderson, 1994; Kotler, 2000; Olson, 1998; Porter, 1990). Maskell (2001a) argues that the cooperation of both upstream and downstream

firms effectively lowers mutual transaction costs and develops fixed contracts. Trust develops to enhance transactions. From the perspective of network theory, positive interaction is a key factor for firms to maintain their competitive advantage (Bell et al., 2009). According to Audretsch and Feldman (1996), Feldman and Florida (1994), Gnyawali and Srivastava (2013), Phelps (2010), White and Bruton (2007), and Zhang and Li (2010), industry clusters can strengthen firms' innovation performance. On the basis of the above literature, through industrial clusters, firms can more easily acquire resources, and thus cut costs. This approach reinforces cluster relationship effects, which in turn influences corporate innovation performance.

H3. Industry clusters significantly and positively influence innovation performance.

Numerous governments use industry clusters as an important policy tool for regional economic development on account of their capacity to attract talent, which results in a variety of information and knowledge exchange modes. Through the formation of clusters, firms can lower their investment costs, access common suppliers, cultivate a professional work force, and develop a spillover effect for techniques and knowledge (Tallman et al., 2004). Lissoni (2001), and McEvily and Zaheer (1999) point out that the structure of an organization's alliance network can strengthen through the sharing of knowledge. According to Leonard and Swap (2000), in highly competitive industry clusters, some important skills in business management, or techniques to do with knowledge, are necessary for the industry cluster to support the activities of the industry. Yli-Renko et al. (2001) find that networks provide critical access to information, and that knowledge acquisition shares a positive correlation with knowledge exploitation in innovation performance. Finally, the knowledge that individuals acquire in the innovation process spreads to different departments and even organizations. In a knowledge economy, information and knowledge exchanges that occur within the cluster reinforce the firms' capability, knowledge creation, and innovation performance (Arikan, 2009; Bathelt, Malmerg, & Maskell, 2004; Casanueva et al., 2013; Connell & Voola, 2013; Lorenzen & Maskell, 2004; Maskell, 2001b; Tallman et al., 2004). According to the above literature, the industry cluster is an important policy for numerous governments when developing regional economies. Industry clusters not only enhance relationships and reorganize resources, but also attract talent. Thus, firms can easily acquire a professional work force, knowledge, and techniques to enhance innovation performance. This study posits that a relationship exists among industrial clusters, knowledge management, and innovation performance.

H4. Knowledge management is the mediator of a significant and positive effect of industry clusters on innovation performance.

3. Methodology

3.1. Research framework

This study first establishes the research framework, then deduces the research hypotheses, and finally describes the analysis tools, statistical methods, sampling method, and sample structure. SPSS statistical software allows for the analysis of the questionnaire data, the description of the research findings, and a comparison of theories with empirical results, all with the aim of drawing conclusions from the study. As per the literature, this study divides industrial clusters into two variables (namely, cluster resources and cluster relationships) and divides knowledge management into knowledge creation and acquisition, and knowledge dissemination and storage. Innovation performance breaks down into market performance and product performance, which serve as variables for the study. Fig. 1 shows the research framework.